

REMARKS

Claims 1 – 14 are currently pending in this application. By the foregoing amendment, independent Claims 1, 11 and 14 have been amended, and new Claims 15 and 16 have been added.

Claims 11 and 13 have been rejected under 35 USC §112, second paragraph based on certain formal issues cited by the Examiner. In particular, the term "high pressure" in Claim 11 is considered to be a relative term, and to render Claim 11 indefinite. In response to this ground of rejection, Applicants have amended Claim 11 to recite that the produced hydrogen is stored "in a pressurized storage container". Accordingly, Claim 11 is now believed to be clear and definite. The rejection of Claim 13, however, is not understood in that Claim 13 depends from Claim 10, not from Claim 11 as indicated in the Office Action. If a different claim was intended to be rejected, or if some other aspect of Claim 13 is believed to be indefinite, clarification of this ground of rejection is respectfully requested.

Claims 1, 4, 5, 9 and 10 have been rejected under 35 USC §102(b) as anticipated by Araoka et al (Japanese patent document 09-139217), while Claims 6 and 7 have been rejected under 35 USC §103(a) as unpatentable over Araoka et al. In addition, Claim 2 has been rejected as unpatentable over Araoka et al in view of Strasser et al (U.S. Patent No. 6,068,942), while Claim 8 has been rejected as unpatentable over Araoka et al in view of Buswell et al and Claims 3

and 11 – 14 have been rejected as unpatentable over Araoka et al in view of Kagitani (U.S. Patent No. 5,900,330). However, for the reasons set forth hereinafter, Applicants respectfully submit that all claims of record in this application distinguish over the cited references, whether considered separately or in combination.

The present invention is directed to a method and apparatus for supplying electric energy to power auxiliary load elements (such as an air conditioner, microwave oven, lighting, etc.) of a vehicle during periods when the vehicle engine is not in operation. In conventional vehicles having a generator or alternator that is driven by the vehicle's internal combustion engine, the generator does not operate to supply electricity during periods when the engine is not operating. Accordingly, it is necessary to provide electricity for items such as air conditioning, lighting, etc. from other sources, such as a battery. However, the state of the art of battery technology is such that sufficient electricity is not available for this purpose. While it is possible to supply electric energy to power auxiliary equipment by running the vehicle engine when the vehicle is not otherwise in operation, this technique is wasteful of energy and unnecessarily pollutes the environment.

The present invention solves the problem of providing electricity to power auxiliary vehicle equipment when the vehicle is idle, by using a portion of the electric power supplied by the generator during periods when the vehicle engine is in operation, to electrolyze water, breaking it down into hydrogen and oxygen. At least the hydrogen is then stored in a storage tank. During periods when the

vehicle engine is not in operation, the hydrogen is supplied to a fuel cell which uses it to generate electricity to supply auxiliary equipment as noted.

Claim 1 of the present application defines a power supply for an auxiliary power unit of a vehicle having a combustion engine, which includes an electrolyzer for generating hydrogen and oxygen from water using electricity from the vehicle's generator during periods when the vehicle engine is running. In particular, Claim 1 recites

"an electrolyzer configured to receive electricity generated by an electric generator that is driven by said combustion engine, when said combustion engine is running, and to generate hydrogen and oxygen by electrolysis of water powered by said electricity received from said electric generator".

Claims 14 and 15 are apparatus claims which are limited similarly to Claim 1. Claim 14 in particular recites a vehicle which includes an electric generator driven by a combustion engine and an auxiliary power unit that comprises, among other things, "electrolyzer means coupled to receive electricity generated by said electric generator when said combustion engine is running, for using said electricity from said electric generator to generate hydrogen and oxygen from water."

In addition, Claims 11 and 16 are method claims which are also similarly limited. Claim 11, for example recites a step of an electrolyzer "using electricity

generated by said electric generator to produce hydrogen while the vehicle's engine is operative". Likewise, Claim 16 recites a step as follows:

"during operation of said combustion engine, using electric power from said electric generator to electrolyze water to produce hydrogen and oxygen."

The latter features of the present invention are neither taught nor suggested in any of the cited references. The Araoka et al reference, in particular discloses a system in which power supplied by a solar battery 4 is used to electrolyze water into hydrogen and oxygen gases, which are then stored and used as fuel for a fuel cell which generates electricity. The Kagitani reference is similar, in that electricity from an energy source, such as a photovoltaic array, a windmill, etc. is used for the same purpose. (See Column 7, lines 59-62; Abstract, lines 13-15.)

Neither of the Araoka et al and Kagitani references teaches or suggests the method or apparatus according to the present invention, in which electric energy generated during operation of a vehicle is used to electrolyze water during such operation to generate hydrogen that is used to power a fuel cell, which then supplies electric energy to load elements of the vehicle during periods of inactivity, as recited in the portions of independent Claims 1, 11 and 14 – 16, noted above.

The Office Action indicates at page 3 that the recitations of other vehicle parts, such as a generator and electricity supplied thereby have not been given

patentable weight. In response to this observation, Applicants have amended the claims in a manner such that they clearly recite limitations that are entitled to be given weight. In particular, as noted previously, Claim 1 recites an electrolyzer that is configured to receive electricity generated by an electric generator driven by the vehicle engine when the engine is running, and to generate hydrogen and oxygen by electrolysis of water powered by the electricity received from the electric generator. Applicants respectfully submit that this language clearly qualifies the nature of the electrolyzer defined by Claim 1, and cannot be ignored. Similarly, method Claims 11 and 16 define a method which is neither taught nor suggested by either of Araoka et al or Kagitani, or any of the other cited references. That is, the latter do not teach or suggest using electric power generated by the electric generator during operation of the combustion engine to electrolyze water to produce hydrogen and oxygen, which are then stored for use in a fuel cell to supply power to a vehicle during periods when it is idle.

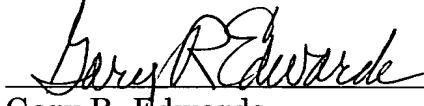
In regard to the latter point, the Office Action states at paragraph 5 that Claims 11 – 14 differ from Araoka et al by requiring the presence of the actual vehicle. However, for the reasons set forth above, Applicants submit that the differences between Claims 11 and 14 go well beyond the mere presence of the vehicle, either as part of the claimed combination or as an operating environment for the method. Finally, the Office Action refers to Kagitani at Column 9, line 59 – 67 as teaching that the system disclosed therein would be useful in a vehicle. However, the portion of the disclosure referred to clearly

refers to the use of electricity generated by a fuel cell for a source of motive power for propelling an electric vehicle. (See Column 9, lines 61 – 64.) Nothing in Kagitani teaches or suggests the method defined in Claims 11 and 16 or the apparatus defined in Claims 1, 14 and 15.

In light of the foregoing remarks, this application should be in condition for allowance, and early passage of this case to issue is respectfully requested. If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #225/50450).

Respectfully submitted,



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